Appendix I
Remediation System Summary
AOI 5 Remedial Investigation Report
Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC

1.0 BACKGROUND

Sunoco Inc. (R&M) previously operated the facility located at 100 Green Street in Marcus Hook, Pennsylvania (facility). The facility was transferred to Sunoco Partners Marketing & Terminals L.P. (SPMT) on April 1, 2013 and is referred to as the Marcus Hook Industrial Complex (MHIC). As of December 30, 2013, Marcus Hook Refinery Operations, a series of Evergreen Resources Group, LLC (Evergreen), assumed the responsibility for remediation liabilities occurring at the MHIC on or before that date. Evergreen's approach to managing these liabilities will be consistent with Sunoco's best practices as detailed in the Work Plan for Site Wide Approach (SWAWP) under the Pennsylvania One Cleanup Program, submitted to the Pennsylvania Department of Environmental Protection (PADEP) and the United States Environmental Protection Agency (USEPA) on December 19, 2011.

Remediation technician services, project management, and project reporting are contracted to Stantec Consulting Services Inc. (Stantec). Status reports are currently provided on a semiannual basis with sections organized according to the Areas of Interest (AOIs) detailed in the SWAWP. The following sections provide a summary of each system in AOI 5.

2.0 MIDDLE CREEK REMEDIATION SYSTEMS

2.1. FORMER RW-10 AND RW-11 REMEDIATION SYSTEM

2.1.1. SYSTEM DESCRIPTION

In 1997, a dual-phase remediation system using recovery wells RW-10 and RW-11 was installed along the northern and southern banks of Middle Creek (see **Figure I-1**) in an attempt to induce hydraulic control in the immediate area and to prevent the migration of LNAPL toward Middle Creek. Total fluids from RW-10 and RW-11 were pumped directly to a facility sewer that discharged to the wastewater treatment plant.

2.1.2. OPERATIONAL HISTORY

The RW-10 recovery well was taken off-line November 14, 2002 due to ongoing issues with iron fouling of the pump and flow meter. The RW-11 recovery well was taken off-line on March 19, 2003 due to electric problems with the transformer that supplied the Middle Creek Remediation System. RW-10 recovered approximately 1.4 million gallons of groundwater and 124 gallons of LNAPL before being taken offline in 2002. RW-11 recovered approximately 1.1 million gallons of groundwater and 1,119 gallons of LNAPL before being taken offline in 2003.

2.1.3. OZONE INJECTION AND TOTAL FLUIDS RECOVERY PUMP TESTS

Two wells were installed in December 2004 adjacent to Middle Creek for an ozone injection pilot study. Ozone injection began in March 2005 and was discontinued during the third quarter of 2006 to allow for

a total fluids recovery pump test that was completed in September 2006. Six additional monitoring wells were installed in the first quarter 2007. A pump test was performed on these wells during the week of July 30, 2007. Results from the ozone injection pilot study and total fluids pump test were used to evaluate potential upgrades to the former RW-10 and RW-11 Remediation System. Quantities of recovered groundwater and LNAPL during the pump test are unknown.

2.1.4. ADDITIONAL REMEDIATION ACTIVITIES

A compressed nitrogen submersible pump was installed and operated in MW-110 between 1999 and 2001. The pump was powered by cylinders of compressed nitrogen that were replaced as needed. Recovered LNAPL was pumped into a 290-gallon storage tank.

LNAPL recovery via a vacuum truck was performed periodically at MW-131 and MW-132 from January 2001 to February 2002 and MonPt#1 and MW-110 from May 2001 to March 2002. MonPt#1 is a corrugated steel pipe located along the north bank of Middle Creek in the vicinity of MW-185. Between 1999 and 2002, the additional remediation activities recovered approximately 175 gallons of LNAPL at these locations.

2.2. MIDDLE CREEK REMEDIATION SYSTEM (RW-A1, RW-B1 AND RW-B2)

In December 2008, the RW-10 and RW-11 Remediation System was replaced with the current configuration of the Middle Creek Remediation System **(Figure I-2).** The Middle Creek Remediation System is located in the southwest quadrant of MHIC near the Delaware-Pennsylvania border. Two groundwater interceptor trenches (Trench A and Trench B) were installed in the area between the 15 Plant Separator and Middle Creek in the vicinity of an oily seep. Three six-inch recovery wells were installed within the two trenches. Bottom loading CCE pneumatic total fluids pumps were installed in recovery wells RW-A1, RW-B1, and RW-B2 which are powered by a 5-horsepower (hp) Kaeser rotary-screw air compressor. Each pump is equipped with a hand-operated valve that can isolate the pump from the compressor. Total fluids are pumped from each recovery well through a line to a common vault. Each discharge line is manifolded into a common trunk line which conveys total fluids to a refinery sewer that discharges to the 15 Plant Separator.

2.2.1. OPERATIONAL HISTORY

The system as it is currently configured was started in the beginning of June 2009 and the groundwater recovery volume reported includes total fluids pumped during the installation and testing phases. All totalizers were removed on August 20, 2009 due to iron fouling which restricted flow. Trenches are field verified as dewatered to confirm system operation on a weekly basis. Recovery for the system is estimated to be 1,831 gallons per day based on pump tests conducted in June/July 2012 and calculated using system up time. Since its inception, the current Middle Creek Remediation System has recovered approximately 4.4 million gallons of total fluids including groundwater and LNAPL (through September 2017).

2.2.2. OPERATION AND MAINTENANCE (O&M) ACTIVITIES

Each week, the operational status of each pumping wells is checked. In addition, the trenches are field verified as dewatered to further confirm system operation, and Middle Creek is inspected during low tide for the visual evidence of oil sheening. Monitoring well MW-192 is gauged on a monthly basis for the presence of LNAPL, and the Kaeser compressor maintenance is performed on an annual basis. The pumps are cleaned as needed.

3.0 PHILLIPS ISLAND REMEDIATION SYSTEM

3.1. SYSTEM DESCRIPTION

The Phillips Island Remediation System is located along the northern shore of the Delaware River (**see Figure I-1**). Phillips Island automated LNAPL recovery was originally implemented at MW-121 in December 1995 with the installation of a LNAPL pumping system. However, limited recovery was realized due to the high viscosity of the LNAPL, and the LNAPL pump was moved to MW-113 in January 1996. The LNAPL pump at MW-113 recovered approximately 230 gallons of LNAPL up to March 14, 1996. Additional information regarding the pumping system at MW-121 was not available, including the total volume of LNAPL recovered.

Solar powered remediation systems were operated at wells at Phillips Island. In 1997, a solar powered remediation system was operated at MW-116. In 1999, a solar powered remediation system was installed at MW-117. In 2000, a solar powered remediation system was installed at MW-121. Approximately 316 gallons of LNAPL were recovered by these systems from MW-117 and MW-121 through November 2001. Additional information regarding the solar powered remediation systems installed in MW-116, MW-117, and MW-121 was not available.

LNAPL recovery via a vacuum truck was performed periodically at MW-113, MW-114, MW-115, MW-116, MW-117, MW-118, MW-119, and MW-121 from February 1999 to March 2002. Approximately 3,792 gallons of LNAPL was recovered from these locations.

The original Upper Phillips Island remediation system was installed at MW-121, MW-113 and the West Shore Sump (WSS). The LNAPL systems included Xitech product skimmers that were powered by six nitrogen bottles connected in series. The pump was controlled by a Xitech panel which was powered by a 12-volt marine battery charged by a small solar panel. The remediation system at WSS was removed during the second quarter 2002. Additional information regarding termination of the skimmer systems, including total volume of LNAPL recovered is not available.

Due to construction activities (circa 2002) associated with the Phillips Island Cogen facility (power plant) many of the former monitoring wells, including the WSS, were destroyed or abandoned. In 2016, the power plant was purchased by the Starwood Energy Group and the facility is now referred to as the Marcus Hook Energy Center.

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A LNAPL seep along the bank of the Delaware River on the Delaware portion of Phillips Island was observed on March 22, 2002. This is documented as DNREC Incident #020322. Sunoco signed and conveyed to DNREC an Agreement to Undertake Remediation Resulting from Environmental Violation regarding the referenced incident. Sorbent booms were installed in the Delaware River surrounding the seeps to control any resulting sheening.

To eliminate LNAPL seeps, a steel sheet pile cut-off wall was installed along the southwest edge of Upper Phillips Island between May 31 and June 17, 2002. A total of 55 AZ-18 continuously-welded 'double-piles' with interlock sealant from Skyline Steel were used to construct the approximately 227-foot long cut-off wall. Sheet piles were factory-coated with coal tar epoxy and delivered in lengths of 65 feet. All 55 piles were partially or fully driven using a vibratory hammer. Fifteen replacement recovery wells (PI-1 through PI-15) were installed behind the sheet pile wall in late June 2002. Remediation system piping to four of the recovery wells (PI-1 through PI-4) was completed in September and October 2002.

The Upper Phillips Island Remediation System (formerly the West Wall System) and the Lower Phillips Island Remediation System (formerly the East Wall Recovery System) were started in February 2003. At that time, total fluids recovered by the Upper Phillips Island Remediation System (Upper System) were pumped, via a single electric double diaphragm pump, to the Lower Remediation shed for processing. Total fluids extracted by the Lower Phillips Island Remediation System (Lower System) and Upper System were processed through an oil/water separator and the recovered water was pumped into a refinery sewer that discharged to the 15 Plant Separator.

The current configuration of remediation systems at Phillips Island (**Figure I-3**) includes three active system areas including the Upper System, the Delaware Seep System, and the Lower System with a total of 49 pumping wells.

The Upper System and Delaware Seep System are located in a common system building and include a total of 31 wells. Compressed air for the Upper System and Delaware Seep System is supplied by a 20 hp Kaeser rotary screw air compressor located at the system shed.

The Upper System's twenty 4-inch diameter wells, including PI-1 through PI-15, MW-116, MW-116A, MW-216, MW-256, and MW-258, are pumped with a Wilden double diaphragm pump through a manifold skid with 20 air actuated valves and a controller to open and close the valves. The actuated valves are controlled with a timer system to regulate the frequency and duration of pumping from the wells. Each Upper System well has a drop tube and foot valve placed approximately two feet from the bottom of each well to maintain liquid in the suction line.

The Delaware Seep System consists of 11 recovery wells in Delaware (OW-2, OW-3, OW-4, OW-7, OW-9, OW-10, OW-11, and OW-12) and in Pennsylvania (OW-13, OW-14, and OW-15) along the Delaware River. Each well contains a QED AP-4 top loading pneumatic pump and are powered by the same 20-hp Kaeser rotary-screw air compressor that powers the Upper System. Total fluids from the Delaware Seep System flow to the Upper System shed where it is combined with the Upper Remediation System discharge before

being pumped to the Lower System shed and then to the W21 Sump. The Delaware Seep System was brought on-line in October 2007.

The Lower System has eighteen 4-inch diameter wells, including W-1, W-2, MW-113, MW-114, MW-215, MW-218, MW-219, MW-221, MW-223, MW-245, MW-259, MW-260, MW-261, SUMP-1, SUMP-3, SUMP-5, SUMP-8 and BIG SUMP. SUMP-1, SUMP-3, and SUMP-5 were brought on-line in November 2007 for additional control along the interceptor trench at the base of the eastern retaining wall. The wells are pumped with a Wilden double diaphragm pump through a manifold skid with air actuated valves and a controller to open and close the valves. The actuated valves are controlled with a timer to regulate the frequency and duration of pumping from the wells. Each Lower System well has a drop tube and foot valve placed approximately two feet from the bottom of each well to maintain liquid in the suction line. In July 2017, SUMP-7A was installed to address localized LNAPL and consists of a sump and a 15 feet long recovery trench with 4 inch well screen. The sump was installed with a manually controlled Wilden double diaphragm pump that is actuated as needed to remove total fluids.

The Phillips Island System configuration had previously been constructed with an oil water separator which processed the recovered fluids and transferred LNAPL to two-550 gallon holding tanks. Recovered water was pumped to facility sump W21-A. The systems were taken offline April 16, 2009 due to a system control failure resulting in a system overflow. The system was modified to remove the oil water separator and holding tanks. Recovered liquids from the Phillips Island Remediation System is pumped to refinery facility sump, W21, which is pumped to the wastewater treatment facility. LNAPL that accumulates in W21 is monitored on a weekly basis and the LNAPL is removed with a vacuum truck as needed. LNAPL recycling and/or disposal is managed by the facility.

Fluids from the Phillips Island Remediation System are pumped through a common flow meter that is located at the Lower System shed. Compressed air for the Lower System is supplied by a Quincy air compressor located at the system shed.

3.2. OPERATIONAL HISTORY

The groundwater recovery volume reported includes total fluids pumped during the installation and testing phases. The LNAPL recovery volume reported includes the solar powered remediation systems operation at MW-117 and MW-121 and the vacuum truck LNAPL recovery at MW-113, MW-114, MW-115, MW-116, MW-117, MW-118, MW-119, and MW-121. Recovery for the system is estimated for the system based upon system operation and is 44,281 gallons per day. Since its inception, the Phillips Island Remediation System has recovered approximately 95.8 million gallons of groundwater and 27,492 gallons of LNAPL (through September 2017). The Upper System is currently being evaluated for efficiency and potential upgrades.

3.3. OPERATION AND MAINTENANCE (O&M) ACTIVITIES

The Phillips Island Remediation System operates consistently with occasional downtime due to planned and unplanned system outages, operations and maintenance, and system repairs. The system had

historically been turned off during site wide gauging and groundwater sampling events (prior to 2015). Additionally, if the facility conducts repairs or maintenance on electrical service or the discharge location, W21, the remediation system may be shut down until discharge can be restored.

Historically, cold weather conditions may cause freezing in lateral lines between the wells and diaphragm pumps. System repairs may include replacing diaphragms in transfer pumps, repairing the air compressors, cleaning and repairs to down-well pumps, and replacement of miscellaneous parts (valves, filters, etc.).

Each week, the systems are checked for operation to confirm that the valves on the actuator skid are working and that the compressors have sufficient oil and are operational. The oil is changed at the Quincy air compressor monthly and the Kaeser air compressor oil is changed annually. The Delaware seep wells are checked weekly to confirm operation. SUMP 1 through SUMP 8 are inspected to confirm that the sumps are dewatered. The pumping wells are gauged bimonthly and the Delaware Seep System wells are gauged quarterly.

4.0 WELL 45 AREA REMEDIATION SYSTEM

4.1. SYSTEM DESCRIPTION

LNAPL was originally reported in MW-45 (a RCRA compliance monitoring point located upgradient of Middle Creek) during a gauging event conducted in October of 1992. The appearance of LNAPL in MW-45 prompted the installation of MW-78 in September 1993. A 1995 investigation revealed LNAPL similar to weathered No. 2 fuel oil near MW-83 and MW-45. The 2012 Current Conditions Report and Comprehensive Remedial Plan further classified LNAPL in the area as slightly weathered diesel. MW-78 was installed and used as an alternative upgradient RCRA groundwater monitoring point through February 1996. MW-86 is the current upgradient RCRA compliance groundwater monitoring point.

4.2. OPERATIONAL HISTORY

Considering the low potential for LNAPL plume migration and the lack of proximal sensitive receptors, passive recovery was initiated in June 1995. A passive bailer was installed in MW-45 and sorbent wicks were placed in MW-44, MW-78, and MW-84 in March 1999. A second passive bailer was installed in MW-83 in May of 1999. The MW-45 passive bailer was removed in August 2000 and a sorbent wick was installed in its place. LNAPL recovery, via a vacuum truck, was performed periodically in MW-83 from May 2001 to March 2002 and in MW-45 from December 2001 to March 2002. Due to the limited presences of LNAPL in the wells, the sorbent wicks were removed from MW-44, MW-78 and MW-84 and the wells were placed on a semi-annual monitoring schedule. In 2009, the monitoring frequency of MW-44, MW-78, and MW-84 was further reduced to an annual basis. Additional information regarding passive recovery systems, including total volume of LNAPL recovered is not available.

Figure No.

I-1

Title

AOI 5 REMEDIATION SYSTEMS

Client/Project

MARCUS HOOK REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC.

Project Location
MARCUS HOOK INDUSTRIAL COMPLEX

213402430
Prepared by GWC on 10/3/2017
Technical Review by JLM on 11/6/2017
Independent Review by AJB on 11/6/2017

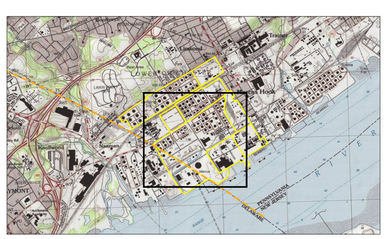
0 150 300 600 Feet

1:1,800 (At original document size of 34x44)

N

LEGEND

- MONITORING WELL
- RECOVERY WELL
- SUMP AND RECOVERY SUMP WELL
- DAMAGED WELL
- DESTROYED WELL
- UNABLE TO LOCATE WELL
- MONPT#1 - 24" CORRUGATED STEEL PIPE
- ACTIVE REMEDIATION SYSTEM
- SHEET PILE WALL
- REMEDIATION SYSTEMS DESIGNATED AS INACTIVE
- MARCUS HOOK ENERGY CENTER
- PENNSYLVANIA DELAWARE STATE BOUNDARY LINE
- SITE AND AREA OF INTEREST (AOI) BOUNDARY
- PENNSYLVANIA MUNICIPALITY BOUNDARY



Notes

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Figure No.
I-2

Title
MIDDLE CREEK REMEDIATION SYSTEM SITE PLAN

Client/Project
MARCUS HOOK REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC

Project Location
100 GREEN STREET
MARCUS HOOK, PA 19061

213402430
Prepared by GWC on 10/3/2017
Technical Review by JLM on 11/6/2017
Independent Review by AJB on 11/8/2017

0 125 250 Feet
1:1,500 (At original document size of 11x17)

N

LEGEND

- ACTIVE SYSTEM RECOVERY WELL
- MONITORING WELL
- INACTIVE OR OTHER SYSTEM RECOVERY WELL
- MONPT#1 - 24" CORRUGATED STEEL PIPE
- REMEDIATION SYSTEM TRENCH
- DISCHARGE LINE
- AIR COMPRESSOR
- MIDDLE CREEK
- PENNSYLVANIA DELAWARE STATE BOUNDARY LINE
- AREA OF INTEREST (AOI) BOUNDARY
- T-101 TANK IDENTIFICATION NUMBER

Notes

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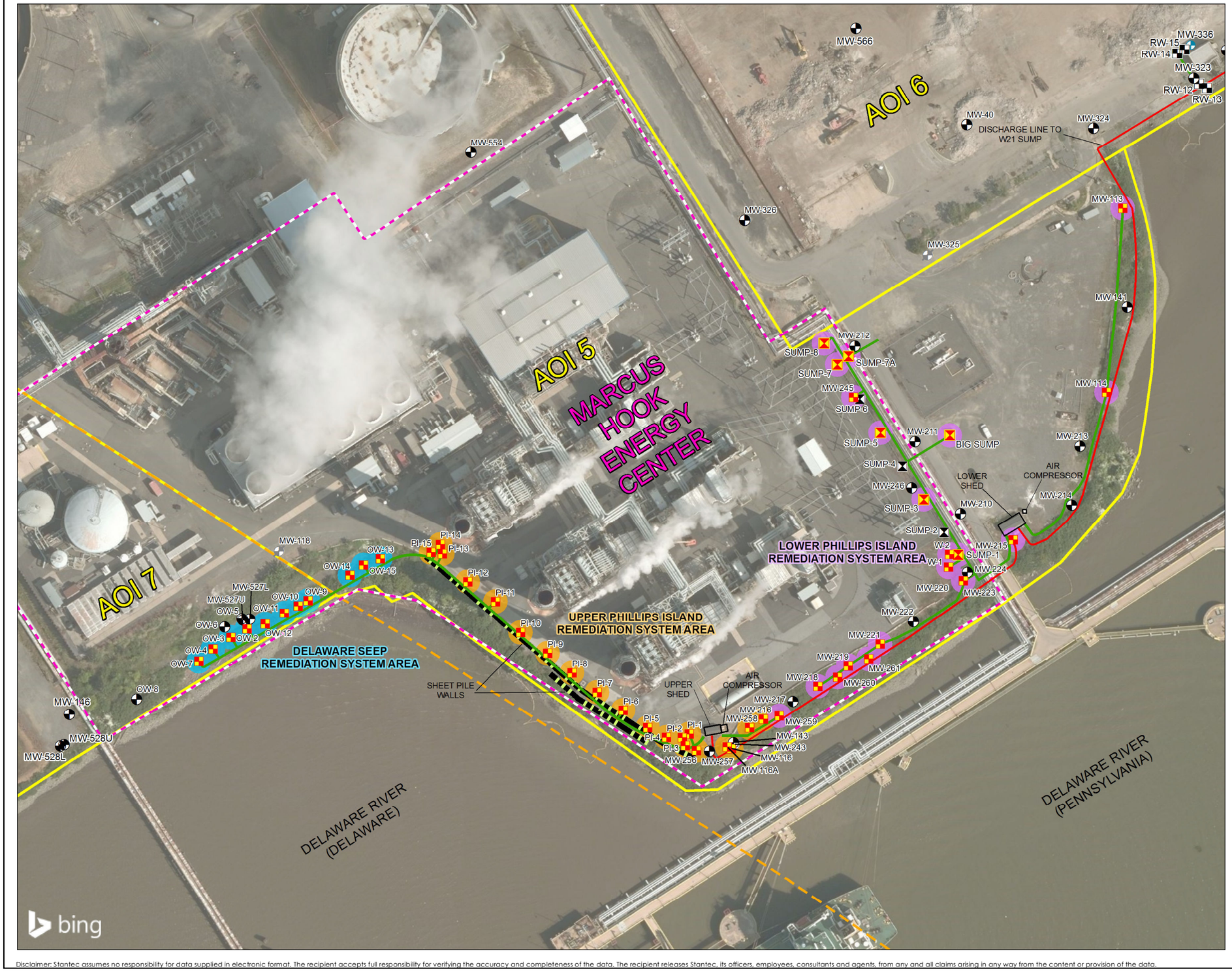

Figure No.
I-3

Title
PHILLIPS ISLAND REMEDIATION SYSTEM SITE PLAN

Client/Project
MARCUS HOOK REFINERY OPERATIONS, A SERIES OF EVERGREEN RESOURCES GROUP, LLC

Project Location
100 GREEN STREET
MARCUS HOOK, PA 19061

213402430
Prepared by GWC on 10/5/2017
Technical Review by JLM on 11/6/2017
Independent Review by AJB on 11/8/2017

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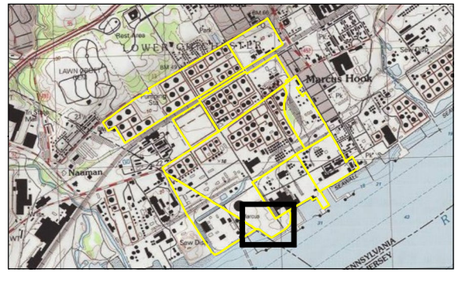
1:1,500 (At original document size of 11x17)

N

LEGEND

- ACTIVE SYSTEM RECOVERY WELL
- ACTIVE SUMP AND RECOVERY SUMP WELL
- INACTIVE OR OTHER SYSTEM RECOVERY WELL
- MONITORING WELL
- SUMP AND RECOVERY SUMP WELL
- DAMAGED WELL
- DESTROYED WELL
- WELL ASSOCIATED WITH LOWER PHILLIPS ISLAND REMEDIATION SYSTEM
- WELL ASSOCIATED WITH UPPER PHILLIPS ISLAND REMEDIATION SYSTEM
- WELL ASSOCIATED WITH DELAWARE SEEP REMEDIATION SYSTEM
- DISCHARGE LINE
- REMEDIATION SYSTEM AND PIPING
- SHEET PILE WALL
- PENNSYLVANIA DELAWARE STATE BOUNDARY LINE
- MARCUS HOOK ENERGY CENTER
- SITE AND AREA OF INTEREST (AOI) BOUNDARY



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